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## Original Article

## Challenges and responses of elective orthopaedic surgery during the second wave of COVID-19



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## ABSTRACT

**Background:** Elective orthopaedic surgery has been severely curtailed because of coronavirus disease, 2019. There is scant scientific evidence to guide surgeons in assessing the protocols that must be implemented before resuming elective orthopaedic surgery safely after the second wave of the coronavirus disease, 2019.

**Methods:** A retrospective review of elective orthopaedic surgeries performed between May 15, 2020, and November 20, 2020, was conducted. A screening questionnaire was used, and reverse transcription-polymerase chain reaction and severe acute respiratory syndrome coronavirus-2 immunoglobulin G and IgM antibodies testing were assessed in all admitted patients. Screening and testing data for coronavirus disease was reviewed for all patients.

**Results:** Of 592 patients tested for severe acute respiratory syndrome coronavirus-2 during the study period, 21 (3.5%) tested positive. There were 2 patients (0.3%) with positive reverse transcription-polymerase chain reaction tests, 3 (0.5%) with positive IgG and IgM antibodies, 13 (2.2%) with positive IgG antibodies, and 10 (1.7%) with positive IgM antibodies. Among these 21 patients, 20 (95.2%) were asymptomatic.

**Conclusions:** Our findings suggest that most elective orthopaedic surgery patients with severe acute respiratory syndrome coronavirus-2 are asymptomatic. In the second wave of coronavirus disease, 2019, universal testing of all patients should be strongly considered as an important measure to prevent clusters of in-hospital transmission of the disease.

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## 1. Introduction

The spread of coronavirus disease, 2019 (COVID-19) has resulted in a pandemic [1]. The long incubation period and asymptomatic spread of COVID-19 present considerable challenges for health-care institutions. The identification of infected individuals is vital preventing the spread of illness to healthcare personnel and other patients besides recognition of those who may be at risk for disease-related complications.

However, many orthopaedic surgical procedures are either life- or limb-saving and cannot be postponed during the COVID-19

pandemic because of potential harm to patients [2]. It is important to prevent clusters and transmission of COVID-19 in the in-patients wards to perform essential orthopaedic surgery during the second wave of COVID-19.

After the first peak of the pandemic, healthcare organizations recognized the need for a planned return to routine care. Therefore, several guidelines were established for resuming elective orthopaedic surgery [3–5].

However, to the best of our knowledge, there is little evidence about universal testing using reverse transcription-polymerase chain reaction (RT-PCR) and severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) immunoglobulin (Ig) G and IgM antibodies for elective orthopaedic surgery [6].

The purpose of the present study was to report the percentage of tests (RT-PCR and antibody assays) positive for SARS-CoV-2

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during admission for elective orthopaedic surgery during the second wave of COVID-19. We aimed to analyze the means by which orthopaedic surgeons could perform essential procedures in a safe manner during the pandemic.

## 2. Materials and methods

This was a retrospective observational study conducted at a secondary care hospital. Our institution is located near a nursing home where the first cluster of COVID-19 cases was recognized in Hyogo prefecture. From May 15 to November 20, 2020, 592 consecutive patients were admitted to inpatients wards for elective orthopaedic surgery and were included in the study. This study was conducted in accordance with the principles laid down in the Declaration of Helsinki.

The institutional review board provided approval for this retrospective study, and the need for written informed consent was waived due to the retrospective nature of the study. Information regarding TOCC (travel, occupation, contact, cluster) risk factors were documented for each patient. Screening for COVID-19 symptoms (fever, cough, dyspnea, myalgia or fatigue, headache, sneezing, sputum production, pharyngalgia, gastrointestinal discomfort, diarrhea, loss of appetite, and loss of taste or smell) was carried out and results were documented. If patients presented with any positive TOCC risk factors and/or exhibited symptoms, they were referred to a COVID-19 outpatient clinic. Thus, none of the included patients exhibited TOCC risk factors or COVID-19 symptoms.

RT-PCR and SARS-CoV-2 IgG and IgM antibody testing was performed prior to elective orthopaedic surgery.

RT-PCR testing was performed on samples taken from the nasopharynx three to five days prior to admission. The RT-PCR assays were performed using LightMix Modular SARS and Wuhan CoV E-gene/Wuhan CoV N-gene (Roche Co., Ltd., Basel, Switzerland). An antibody testing for SARS-CoV-2 IgG and IgM was performed on the day of admission using the ALLTEST 2019-nCoV IgG/IgM Rapid Test Cassette (Hangzhou ALLTEST Biotech Co., Ltd., Hangzhou, China).

The patients were at an increased risk of being asymptomatic carriers owing to the ongoing scenario of the spread of COVID-19. The travel history was no longer considered a contributing factor given the widespread prevalence of COVID-19. Thus, we deleted the travel history from the screening questionnaire after October 21, 2020.

During the study period, the hospital maintained a no visitor policy.

Statistical analyses were performed using Excel statistics software (Microsoft Office 10, Microsoft, Seattle, USA). Data are represented as the mean and the standard deviation, and percentages.

## 3. Results

We enrolled 592 consecutive patients (194 men and 398 women; mean age:  $67 \pm 20$  years) who were admitted to our hospital. The patients included in this study underwent varied surgical procedures. Procedures comprising surgeries of the spine, upper and lower extremities, total arthroplasties, fracture repairs, arthroscopies, and others were performed (Table 1). However, no urgent and emergency operations were performed.

The procedures were carried out under general, conduction and local anesthesia in 560, 31, and 1 patient, respectively.

The IgM antibody test was documented to be positive in patient for the first time on June 17. This patient was transferred to a COVID-19 ward for isolation. The patient subsequently underwent RT-PCR testing and was found to be negative for COVID-19.

**Table 1**  
Baseline characteristics of operative patients.

Variable	Total (n = 592)
Sex	
Male	194
Female	398
Age	$67 \pm 20$
Anesthesia	
general	560
conduction	31
local	1
Surgical procedure	
ORIF	139
TKA	128
THA	118
Spinal	93
Extraction	37
BHA	32
Arthroscopy	13
Others	32

ORIF Open reduction and internal fixation.

TKA Total knee arthroplasty.

THA Total hip arthroplasty.

BHA Bipolar hip arthroplasty.

Therefore, an institutional policy change occurred on June 17, 2020, which directed that IgG and IgM antibody testing should be performed during preoperative work-up.

As shown in Table 2, 21 of 592 (3.5%) patients tested positive for SARS-CoV-2 during the study period. There were 2 (0.3%) patients with positive RT-PCR testing, 3 (0.5%) with positive IgG and IgM antibodies, 13 (2.2%) with positive IgG antibodies, and 10 (1.7%) with positive IgM antibodies. Among those 21 patients, 20 (95.2%) were asymptomatic. One patient was asymptomatic at admission to the internal medicine unit and was then transferred to the orthopaedic unit for biopsy.

The surgical procedures that were performed included arthroplasty in 12 patients, and open reduction and internal fixation, bipolar hip arthroplasty, neurolysis, extraction, and biopsy in 1 patient each.

They were performed under general, conduction, and injection anesthesia in 17, 3, and 1 patient, respectively.

All 19 patients with negative RT-PCR assays underwent elective orthopaedic surgery and experienced an uneventful clinical course without any complications.

The first patient to test positive by RT-PCR testing was an 81-year-old woman who had been very careful. The patient's medical history was significant for rheumatoid arthritis and was on treatment for the same in the department of internal medicine. The patient had no TOCC risk factors or COVID-19 symptoms but was transferred to the COVID-19 wards based on the test results and was discharged from the hospital because of the absence of COVID-19 symptoms after confirmation with a negative RT-PCR test. Two months after discharge, the patient underwent a left-sided total knee arthroplasty under general anesthesia and recovered with excellent knee function without any complications.

The second patient was a 47-year-old woman who had been admitted in the internal medicine unit. The patient was referred to the department of orthopaedic surgery for a biopsy. The infection control team recommended an omission of RT-PCR testing in this patient, according to the institutional policy. Subsequently, a biopsy was performed under local anesthesia. On postoperative day 1, the patient experienced a loss of smell, was tested immediately and was found to have positive RT-PCR and IgG assay results. This patient had previously been admitted in a room with 4 beds. Therefore, the two other patients in the same room, were isolated and tested using RT-PCR for COVID-19. In addition, one surgical care

**Table 2**  
Baseline characteristics of positive COVID-19 operative patients.

Age	Sex	Diagnosis	Anesthesia	Operation	RT-PCR	IgG	IgM
71	female	hip and knee osteoarthritis	general	THA&TKA	–	–	+
67	female	knee osteoarthritis	general	TKA	–	+	+
51	male	ulnar tunnel syndrome	conduction	Neurolysis	–	+	–
67	male	post tibia ORIF	general	Extraction	–	–	+
75	female	knee osteoarthritis	general	TKA	–	+	–
93	female	hip fracture	general	ORIF	–	–	+
79	female	knee osteoarthritis	general	TKA	–	+	–
91	female	hip osteoarthritis	general	THA	–	+	–
66	female	hip osteoarthritis	general	THA	–	+	–
81	female	knee osteoarthritis	general	TKA	–	–	+
64	female	hip fracture	general	BHA	–	+	+
73	male	knee osteoarthritis	general	TKA	–	–	+
90	female	radius fracture	conduction	ORIF	–	–	+
74	female	digital phalanx fracture	conduction	ORIF	–	+	–
82	female	hip fracture	general	BHA	–	+	–
85	female	hip osteoarthritis	general	THA	–	+	+
72	female	hip osteoarthritis	general	THA	–	+	–
44	female	sacroiliac joint arthritis	injection	Biopsy	+	+	–
80	female	knee osteonecrosis	general	TKA	+	–	–
77	female	knee osteoarthritis	general	TKA	–	–	+
71	female	knee osteoarthritis	general	TKA	–	+	–

THA Total hip arthroplasty.

TKA Total knee arthroplasty.

ORIF Open reduction and internal fixation.

nurse and one in-patient care nurse were also isolated and tested using RT-PCR. All four tested negative for SARS-CoV-2.

#### 4. Discussion

Our study revealed a COVID-19 incidence rate of 3.5% between May 15 and November 20, 2020 among patients admitted for elective orthopaedic surgery, using routine nasopharyngeal RT-PCR testing and assays for SARS-CoV-2 IgG and IgM antibodies.

Although the tests were documented to be positive in 21 patients, the most important finding was that 20 among these 21 (95.2%) patients were asymptomatic.

In a study by Gruskay et al., 7 of 12 patients (58.3%) who tested positive for COVID-19 were found to have no symptoms suggestive of COVID-19 infection at presentation except for 1 patient who had pneumonia on a postoperative chest radiograph [7].

The findings in our study were consistent with those in their report. We noted that 1 out of the 2 patients (50%) who tested positive for COVID-19 had no symptoms.

This could be due to the fact that 19 of the 21 (90.5%) patients had been infected earlier and subsequently recovered.

These results suggest that positive SARS-CoV-2 antibody patients were considered for those already infected.

Thus, using SARS-CoV-2 antibody test as a screening method for patients in the early stages of the active disease would be ineffective. Hence, SARS-CoV-2 antibody tests are not recommended for diagnosis of current infection with COVID-19. However, patients may feel more comfortable undergoing an elective surgical procedure with the knowledge that they have antibodies to the virus and thus may be immune to the disease.

Therefore, we recommend RT-PCR testing for diagnosis of current infection with COVID-19.

Gruskay et al. reported that 12.1% of the patients were positive in tests done using preoperative nasopharyngeal swabs for COVID-19 [7]. Contrastingly, we observed a low positive rate in preoperative nasopharyngeal swab testing for COVID-19. However, this could have been due to the relatively large number of patients tested in our cohort in comparison to theirs.

San Miguel County, Colorado reported that SARS-CoV-2 IgG antibody tests were performed county-wide in March and April, 2020. Twenty-nine of 5455 tested individuals (0.53%) were IgG positive, and 79 (1.45%) were borderline. Our results showed a high rate of IgG and IgM positivity. This could be due to the relatively fewer patient numbers in our study compared to the San Miguel study.

Lei et al. described the clinical characteristics and outcomes of patients who were inadvertently scheduled for elective surgery during the incubation period following exposure to SARS-CoV-2. This retrospective cohort study found that 44.1% of the patients needed ICU care, and the mortality was 20.5% [8]. Mi et al. reported that four out of 10 SARS-CoV-2 infected patients with fractures died after admission [9]. The outcomes in these studies suggest that patients with COVID-19 should not undergo elective orthopaedic surgery. Therefore, we decided to operate on only those patients who tested negative by RT-PCR. In our study, the 20 patients who underwent elective orthopaedic surgery showed good clinical progress without any complications. Our results support the findings of these reports, since none of our patients developed COVID-19.

Patients who were scheduled for elective orthopaedic surgery in our study were asymptomatic COVID-19 carriers. Hence, our goal was to analyze how orthopaedic surgeons could perform essential procedures in a safe manner during the second wave of COVID-19.

Our experience underscores the need for isolation of COVID-19 patients and their close contacts in hospital. Thus, the identification of infected individuals is vital to prevent the spread of illness to other hospital personnel and patients.

We advocate that elective orthopaedic surgery should be performed after universal preoperative RT-PCR testing during the second wave of COVID-19.

Our study has one notable limitation. The sample included only those who were scheduled for elective orthopaedic surgery, thereby increasing the probability of selection bias. However, we can confidently assert that universal testing should be carried out.

Since the implementation of universal testing in patients planned for elective orthopaedic surgery, the majority of SARS-CoV-2 positive cases were detected in asymptomatic patients than in those already infected.

## 5. Conclusion

In conclusion, our findings suggest that universal preoperative RT-PCR testing of patients planned for elective orthopaedic surgery should be strongly considered as an important measure to prevent clusters and in-hospital transmission of COVID-19.

These results can be extrapolated to all patients undergoing essential surgery and could help restructure hospital policy based on evidence.

## Declaration of competing interest

None.

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